

meningitis and one of septicaemia in man caused by haemolytic streptococci. Further strains have been isolated from man by several workers, and Kloppenburg *et al*<sup>4</sup> drew attention to the fact that all 15 reported cases had occurred in the Netherlands or Denmark and nearly all were of purulent meningitis. One patient kept pigs on his own premises for future processing in the factory, and the actual source of his infection was not identified. The incubation period, however, indicated that infection had resulted from his injury. Swabs from the machine and other apparatus at the factory were unobtainable and swabs from the patient's hand wound taken the day after admission failed to grow streptococci. Most previous cases have resulted from an infected wound. Purulent arthritis is a well known complication of group R streptococcal infection in pigs but as yet has not been recorded in man. Unfortunately our patient's hip was aspirated too late in the course of his illness to isolate the infecting organism, which was presumably a streptococcus.

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<sup>1</sup> Field, H I, Buntain, D, and Dove, J T, *Veterinary Record*, 1954, **66**, 453.

<sup>2</sup> de Moor, C E, *Verslagen en Medelingen Betreffende de Volksgezondheid*, 1959, **2**, 474.

<sup>3</sup> Perch, B, Kristjansen, P, and Skadhauge, Kn, *Acta Pathologica et Microbiologica Scandinavica*, 1968, **74**, 69.

<sup>4</sup> Kloppenburg, M, Mulder, N H, and Houwerzijl, J, *Lancet*, 1975, **2**, 1218.

<sup>5</sup> Windsor, R S, and Elliott, S D, *Journal of Hygiene*, 1975, **75**, 69.

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## Low molecular weight dextran: a continuing cause of acute renal failure

Low molecular weight dextran (LMWD), though not usually considered to be highly nephrotoxic, may precipitate acute renal failure (ARF) in certain conditions.<sup>1</sup> It may be the commonest cause of drug-induced ARF. Seven out of eight cases of drug-induced ARF referred to this unit from several hospitals during a recent eight-month period were caused by LMWD (10% dextran 40 in six cases and 6% dextran 70 in one case). All seven patients had ischaemic disorders.

### Case histories

The case histories of patients are summarised in the table. In none could any cause other than LMWD be found for the ARF. All had widespread arterial disease and possibly such patients are particularly sensitive to the nephrotoxic effects of LMWD. In every case the onset of renal failure was relatively slow with a progressive decline in urine volume over three to six days. This was well illustrated by case 2, whose sequential daily urine volumes from the start of LMWD treatment were (in ml) 1900, 1000, 800, 650, 155, 0. Circulatory overload developed during this period.

Despite the decline in urine output LMWD was not withdrawn from any of the patients, and five developed complete anuria. During recovery there was not, as in many cases of ARF, a rapid diuresis but a slow rise in urine volume of 100-300 ml/day. Only two patients (3 and 6) achieved a diuresis of greater than 2 l/day. Dextran did not help the primary condition of any of the patients.

### Comment

Dextran of molecular weights below 60 000 easily filter through the glomerulus. They may accumulate in proximal tubular cells giving the swollen, vacuolated appearance of "osmotic nephropathy," although this appearance does not correlate with changes in renal function.<sup>2</sup> The high viscosity of concentrated dextran probably causes renal dysfunction by tubular plugging.<sup>3 4</sup> Damage is more likely to occur when renal perfusion is reduced<sup>3 4</sup>—a probable factor in cases 2, 4, and 7—or if renal damage is already present,<sup>1</sup> as in patients 2 and 6. Maintenance of diuresis with fluids and diuretics may protect the kidneys<sup>3</sup> and may have prevented the need for dialysis in cases 4 and 6, who were referred and treated before anuria occurred.

Except in cases 1 and 5 the total dosage of LMWD was within the accepted therapeutic range, but treatment was continued despite falling urine volumes. The occurrence of anuria with 6% dextran 70 in patient 7 is unusual, as only a small proportion of the dextrans in this solution are filtered through the glomerulus.

The uses of LMWD are limited. When it is indicated its propensity to cause ARF should be remembered and the following therapeutic rules observed<sup>5</sup>: (1) do not infuse faster than 1 l/day; (2) do not give if the urine output is below 1500 ml/day; (3) withdraw if the specific gravity of the urine rises above 1045; (4) do not give if the blood urea is above 10 mmol/l (60 mg/100 ml). A reduced urine output indicates that LMWD should be withdrawn and diuresis induced with diuretics and a high fluid intake.

Strict adherence to these rules would probably have prevented all the cases of LMWD-induced renal failure reported here.

<sup>1</sup> Matheson, N A, and Diomi, P, *Surgery, Gynaecology and Obstetrics*, 1970, **131**, 661.

<sup>2</sup> Diomi, P, *et al*, *Laboratory Investigation*, 1970, **22**, 355.

<sup>3</sup> Mailloux, L, *et al*, *New England Journal of Medicine*, 1967, **277**, 1113.

<sup>4</sup> Chinitz, J L, *et al*, *Journal of Laboratory and Clinical Medicine*, 1971, **77**, 76.

<sup>5</sup> Holt, G, *Bibliotheca Anatomica*, 1973, **11**, 359.

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Case histories of seven patients with acute renal failure after administration of low molecular weight dextran

Case No	Age	Sex	Primary diagnosis	Dose of 10% dextran 40	Initial plasma urea concentration (mmol/l)	Initial urine volume (ml/day)	Duration of decline	Duration of complete anuria	Type and duration of dialysis	Comment
1	72	F	Diabetic gangrene of left foot	4 l in 2 days	Not measured	Not measured	3 days	28 days	Peritoneal; 4 weeks	Leg amputated after ARF
2	54	F	Ischaemic left leg, mesenteric ischaemia	3.5 l in 3 days	17.5	1900	6 days	11 days	Peritoneal; 15 days	Chronic pyelonephritis. Leg recovered
3	86	F	Ischaemic right foot	5 l in 5 days	8	Not measured	6 days	3 days	Peritoneal; 6 days	Foot improved after phenol sympathetic block
4	78	F	Left brachial embolus	2 l in 2 days	7.5	1000	3 days	12 hrs	Not needed	Embolectomy under local analgesia. Early treatment with frusemide
5	57	M	Left popliteal embolus	6 l in 5 days	Not measured	Not measured	6 days	14 days	Peritoneal and haemodialysis	Leg amputated after ARF. Died of pneumonia and disseminated intravascular coagulation
6	73	M	Diabetic gangrene of left foot	5.5 l in 5 days	21.9	1500	6 days	>450 ml/day	Not needed	Amputation after renal recovery. Early frusemide treatment
7	70	M	Polycythaemia. Ischaemic left foot	5 l in 5 days*	Not measured	Not measured	5 days	6 days	Haemodialysis; 7 days	Some recovery of foot

\*Dose refers to 6% dextran 70. ARF = acute renal failure. Conversion: SI to traditional units—plasma urea: 1 mmol/l  $\approx$  6 mg/100 ml.